

# New Zealand's elimination strategy for the COVID-19 pandemic and what is required to make it work

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In this editorial we summarise the threat posed by the COVID-19 pandemic, the justification for the elimination strategy adopted by New Zealand, and some of the actions required to maximise the chances of success.

## What is the size and nature of the threat?

The COVID-19 pandemic, caused by the SARS-CoV-2 virus, has shown a relentless ability to infect the world's population. The virus is highly infectious, with each case typically infecting 2–3 others (a reproduction number [R<sub>0</sub>] of about 2.5). Consequently, it has the potential to infect about 60% (crudely estimated as 1-1/R<sub>0</sub>) of the world's population during the next 1–2 years as pandemic waves work their way around the planet.

There are many measures of health impact, but case-fatality risk (CFR) is one of the most important. A reasonable working estimate is a 1% CFR for the population as a whole, with risk increasing markedly for those aged 60+ years and those with comorbidities.<sup>1</sup> The more useful measure is the infection fatality ratio, which is based on the total proportion of the population infected and can usually only be estimated retrospectively by serological surveys. Modellers have now cleverly calculated this for China, producing an estimate of 0.66% (0.39–1.33).<sup>2</sup> Putting these numbers together suggests this pandemic could kill 0.4% of the world's population (about 30 million people).

In New Zealand, we have used disease modelling to improve on these estimates, because modelling can take account of a lot more factors than basic data, including

the fact that populations take measures to protect themselves.<sup>3</sup> Under one of the more likely scenarios if the country's current elimination strategy fails, New Zealand could expect approximately 14,400 deaths.<sup>3</sup> In addition, large numbers of people who are ill and hospitalised could swamp health services at all levels and prevent the delivery of elective services and preventive care.

A poorly controlled pandemic will greatly increase health inequities. Like seasonal influenza in New Zealand, risk is particularly concentrated in older people and those with severe comorbidities.<sup>4</sup> Therefore Māori and Pacific peoples could be more vulnerable, as seen in past influenza pandemics.<sup>5</sup>

## What are the strategic options?

Pandemic planning in New Zealand, as in most countries, has been dominated by measures to manage influenza pandemics. For good reason, given experience with the 1918 influenza pandemic.<sup>6</sup> With the rising threat of the COVID-19 pandemic in January, New Zealand used its existing national influenza pandemic plan as a basis for its response.<sup>7</sup> This planning is appropriately based on a mitigation model, and focuses on delaying the arrival of influenza, and a range of measures to 'flatten the curve' of the pandemic. There is no expectation that any measures can halt an influenza pandemic (short of complete border closures, termed 'protective sequestration', which has protected Pacific Islands in the past<sup>8</sup>).

We are now seeing this mitigation approach being applied in countries across Europe, North America and Australia where the COVID-19 pandemic is spreading

widely. A variation of this approach is the suppression strategy, where the curve is flattened to the point where there are relatively few cases. This approach is likely to require a prolonged 'lockdown' response which may last for months until an effective vaccine or antivirals are available.<sup>9</sup> Attempts at the suppression approach are increasingly replacing mitigation as the pandemic overwhelms healthcare systems.

But COVID-19 is not pandemic influenza.<sup>10</sup> The potential to contain it has not been adequately appreciated. This difference is largely a function of the biology and epidemiology of this infection. COVID-19 infection has a longer incubation period (median of 5–6 days) than influenza (1–3 days). This feature provides an opportunity for case identification and isolation and tracing and quarantining of contacts to succeed, but probably only if done swiftly and effectively.<sup>11</sup>

The strongest evidence that containment, on the path to elimination, works comes from the remarkable success of China in reversing a large pandemic.<sup>12</sup> Of particular relevance to New Zealand are the examples of smaller Asian jurisdictions, notably Hong Kong, Singapore,<sup>13</sup> South Korea<sup>14</sup> and Taiwan.<sup>15</sup>

New Zealand had a brief time-window to refine its plan before the pandemic arrived with the first COVID-19 case on 28 February.<sup>16</sup> At the time of writing, there were just over 800 identified cases, almost entirely in people who had recently returned from overseas or their contacts. However, there were several cases of community transmission, which was likely to be more widespread than numbers indicated because the initially limited diagnostic testing capacity was focused on people with a travel history.

New Zealand therefore had a major choice. A more familiar mitigation strategy or a more ambitious elimination approach. Technically, elimination is the eradication of an infectious disease at a country or regional level, with the term eradication reserved for global extinction of an organism. Disease elimination has been applied to a wide range of human and animal infectious diseases, though an effective vaccine is often required.<sup>17</sup>

By mid-March there was growing support for an elimination strategy.<sup>18</sup> The Government introduced a four-tier response system on 21 March and the country was placed on 'level 2' response (which involved limitations on mass gatherings and encouraging increased physical distancing). The country then escalated rapidly to 'level 4' (widely described as a 'lockdown' involving closing all schools, non-essential workplaces, social gatherings and severe travel restrictions) which came into force on the evening of 25 March 2020. A national emergency was also declared, giving authorities additional powers to enforce control measures.

This elimination strategy is a major departure from pandemic influenza mitigation. With the mitigation strategy, the response is increased as the pandemic progresses and more demanding interventions such as school closures are introduced later to 'flatten the curve.' Elimination partly reverses the order by introducing strong measures at the start in an effort to prevent introduction and local transmission of an exotic pathogen such as COVID-19. This approach has a strong focus on border control, which is obviously easier to apply for island states. It also emphasises case isolation and quarantine of contacts to 'stamp out' chains of transmission. If these measures fail and there is evidence of community transmission, it then requires a major response (physical distancing, travel restrictions and potentially mass quarantines or 'lockdowns') to extinguish chains of transmission.

## Benefits and risks

The elimination strategy has benefits over mitigation: if started early it will result in fewer cases of illness and death. If successful it also offers a clear exit path with a careful return to regular activities with resulting social and economic benefits for New Zealand. The elimination strategy can also support Pacific Island neighbours to remain free of this virus once they relax current border controls.

The elimination strategy also has risks and these may be substantial. To make elimination work, New Zealand had no feasible alternative but to escalate its response to a national 'lockdown', mainly to give it time to ramp up key control measures.<sup>18</sup> A full national 'lockdown' was probably also

needed to ensure the population would swiftly transition to the physical distancing behaviours needed to limit spread and extinguish chains of transmission. New Zealand disease control planning was not greatly influenced by the SARS pandemic, which many countries in Asia experienced, and public awareness of concepts like quarantine and isolation have probably been poor.<sup>19</sup>

The lockdown does, however, have large social and economic costs, and is likely to be particularly tough for those with the fewest resources. The Government response includes a range of interventions to support these groups, including a major economic support package and restrictions on rent increases.

### What we need to do to make elimination work

Elimination is a well-recognised strategy for infectious disease control, and New Zealand can draw on public health experience of eliminating a range of human and animal infectious diseases. In particular there are lessons to be learned from the measles and rubella elimination strategy,<sup>17,20</sup> albeit with the difference that we do not yet have an effective vaccine for COVID-19. Past experience has taught us that there are three factors that are critical to elimination success: 1) high-performing epidemiological and laboratory surveillance systems; 2) an effective and equitable public health system that can ensure uniformly high delivery of interventions to all populations, including marginalised groups (in this instance intervention is focused on diagnosis, isolation of cases and quarantine of contacts rather than vaccine); and 3) the ability to sustain the national programme and update strategies to address emerging issues.

The essential elements of an elimination strategy for COVID-19 are likely to include:

1. Border controls with high-quality quarantine of incoming travellers;
2. Rapid case detection identified by widespread testing, followed by rapid case isolation, with swift contact tracing and quarantine for contacts;
3. Intensive hygiene promotion (cough etiquette and hand washing) and provision of hand hygiene facilities in public settings;
4. Intensive physical distancing, currently implemented as a lockdown (level 4 alert) that includes school and workplace closure, movement and travel restrictions, and stringent measures to reduce contact in public spaces, with potential to relax these measures if elimination is working;
5. A well-coordinated communication strategy to inform the public about control measures and about what to do if they become unwell, and to reinforce important health promotion messages.

Given how infectious the SARS-CoV-2 virus is, multiple measures will need to be taken to ensure all of these control interventions are working in an optimal way. For example, there is good evidence for the use of mobile phone technology to speed up the effectiveness of contact tracing and quarantine.<sup>21</sup> Greater use of face masks may also be needed to reduce the risk of virus transmission by people during the pre-symptomatic phase of their infections.<sup>22</sup>

At the same time as the above pandemic control measures are implemented, steps need to be taken to reduce impacts of the pandemic on the health system and healthcare workers if successfully achieving elimination is prolonged. Preparation of hospitals is already underway with enhanced infection control measures and sourcing of staff and equipment to increase surge capacity. In particular, health services are working actively to expand intensive care unit (ICU) and ventilator spaces in case there is a need to treat large numbers of patients with respiratory failure.

The control measures will also require a rapid and potentially large expansion of other workforce and support systems (eg, information systems for case and contact management).

The exit path will need to be based on demonstrable high-performing border controls and case and contact follow-up, along with sufficient testing and surveillance to detect a low risk of COVID-19 circulation in the population. Under these circumstances, the 'lockdown' can be gradually relaxed, potentially on a regional basis.

## What to do if the elimination strategy fails?

Success with the elimination strategy is far from certain in New Zealand. In the meantime, the country will need to keep accelerating its preparations for a potential shift to the suppression or the mitigation strategy. These preparations could vastly reduce the mortality burden of vulnerable populations (particularly older people and those with chronic conditions<sup>23</sup>). In particular, there could be a 'safe haven' programme to protect such populations in their own homes, institutions and communities. These could be rolled out by city, region and nationally, based on the spread of the pandemic within the country.

## Conclusions

New Zealand society has made a large 'upfront' sacrifice in pursuing an elimination

strategy. Its actions in the coming weeks will decide if this goal can be achieved. To justify this sacrifice we need to put maximum effort into giving this intervention the best possible chance of success. These are uncharted waters for public health.

The strategy will need to be fine-tuned and enhanced in multiple ways as we learn more about how COVID-19 behaves in the New Zealand setting. To achieve that, we will need to make maximum use of the many science disciplines and technologies we have available to inform and guide our response in innovative ways. The COVID-19 pandemic has also forcefully demonstrated the need for ongoing provision of effective public health infrastructure and resources to ensure that New Zealand is able to protect its population during a severe public health emergency.<sup>24</sup>

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### Competing interests:

Nil.

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